

The Ceylon Ophioglossaceae

by

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(With one text figure and two plates)

INTRODUCTION

The study of the family Ophioglossaceae commenced with the description of *Lunaria minor* now called *Botrychium lunaria* (L.) Sw. by Leonard Fuchs in 1542.

Linnaeus described six species of *Ophioglossum* in his Species Plantarum (1753). Of these, two have now been found to belong to the genus *Lygodium* while the other four are retained in the original genus. These are *O. vulgatum*, *O. lusitanicum*, *O. reticulatum* and *O. palmatum*. The genera now recognized as *Helminthostachys* and *Botrychium* along with several others were placed under *Osmunda* by Linnaeus. The Ceylon plant described as *Osmunda zeylanica* by him is *Helminthostachys zeylanica*.

The first serious study of the Ophioglossaceae was attempted by Presl in 1845. He studied the family in great detail and he recognized 48 species which he placed in 6 genera viz. *Botrychium* 17 species, *Rhizoglossum* 1 species, *Ophioglossum* 25 species, *Ophioderma* 1 species, *Cheiroglossa* 1 species and *Helminthostachys* 3 species. The two large genera, *Botrychium* and *Ophioglossum*, were subdivided by him according to the nature of the venation. Hooker and Baker (1868) in their *Synopsis Filicum* reduced the number of species to 17 and the genera to 3 viz. *Botrychium* with 6 species, *Helminthostachys* 1 species and *Ophioglossum* 10 species. Prantl (1883 & 1884) made an extensive study of the Ophioglossaceae and in his monograph recognized 15 species of *Botrychium* and 29 of *Ophioglossum*. He used leaf architecture, venation and sculpturing of the spore coat as taxonomic characters. Towards the beginning of the present century Copeland (1909) and Van Alderwerelt van Rosenburgh (1909) described a large number of new species from the Malay-Asiatic region. The most recent monographic study is that of Clausen (1938). He recognized 3 genera with 52 species viz. 23 species of *Botrychium*, 1 of *Helminthostachys* and 28 species of *Ophioglossum*. The 3 genera *Rhizoglossum*, *Ophioderma* and *Cheiroglossa* of Presl have been reduced to the rank of sub-genera under the genus *Ophioglossum*.

The genera *Botrychium*, *Helminthostachys* and *Ophioglossum* which are all placed in a single family, the Ophioglossaceae, form a primitive pteropsid group. The 3 genera constitute a reduction series, the genus *Botrychium* with dichotomous open venation and a much

divided leaf being the most primitive and *Ophioglossum* with its reticulate venation and little-or undivided leaf being the most advanced with *Helminthostachys* occupying an intermediate position.

This primitive group has no fossil record and appears to have branched off from the pteropsid group at a very early period. All the present day species are terrestrial or epiphytic herbaceous perennials. The sporophytes usually have short, erect rhizomes with little or no branching. Each of these usually produces a single leaf during a growing season and as a leaf does not normally last for more than a year each plant usually has only a single leaf at a time. The leaf stalk has a sheathing base which encloses the bud. The leaves grow very slowly. They are not circinate in their veneration, may be simple, lobed or compound and may show an open dichotomous venation or a reticulate venation. A leaf is erect or pendent and is divided into sterile and fertile segments. The sporangia are carried on the fertile segment which represents two lateral lobes which are often fused in an erect position. Occasionally these two lobes remain separate.

The young plants of *Botrychium*, *Helminthostachys* and some species of *Ophioglossum* are protostelic but a well-developed pith is present in mature plants. The xylem is mesarch in *Helminthostachys* and endarch in the other two. Leaf traces are large simple strands which have prominent leaf gaps. Weak cambial activity is present in the genus *Botrychium*, a feature not present elsewhere among the living ferns. The rhizome bears a cluster of stout fibrous roots which are usually simple, mycorrhizal and lacking in root hairs. The fertile segments may be simple, pinnately compound or may consist of a main axis carrying numerous short fertile lobes. The large eusporangiate sporangia are marginal and produce large numbers of spores with thick and sculptured walls. Gametophytes are subterranean but occasionally may develop above ground. They may be simple or branched and cylindrical. Chlorophyll is lacking and they depend on an endophytic fungus for their nourishment.

The members of the *Ophioglossaceae* are of world-wide distribution. Beddome (1883) in his *Handbook to the Ferns of British India, Ceylon and the Malay Peninsula* describes for Ceylon *Botrychium virginianum* var. *lanuginosum*, *Helminthostachys zeylanica* and two species of *Ophioglossum*, *O. reticulatum* and *O. pendulum*. In his supplement to the *Ferns of British India, Ceylon and the Malay Peninsula* (1892) he records two more species of *Ophioglossum* for Ceylon, *O. gramineum* and *O. fibrosum*. Willis (1911) in his *Revised Catalogue of the Indigenous Flowering Plants and Ferns of Ceylon* lists under *Ophioglossaceae* two species of *Botrychium*, *B. daucifolium* Wall. and *B. virginianum* (L.) Sw., one of *Helminthostachys*, *H. zeylanica* (L.) Hk., and three species of *Ophioglossum*, *O. pedunculatum* Desv. (*reticulatum*, auct.), *O. gramineum* Willd. (*O. lusitanicum*, A. Br.) and *O. pendulum* L. Chakravarty (1951) in his paper on Indian *Ophioglossum* records for Ceylon three species, *O. vulgatum* L., *O. fibrosum* Schum. and *O. pendulum* L. This present paper is a description of the local species of the family *Ophioglossaceae* in the light of the very detailed study of Clausen (1938). All records of specimens referred to are from the Peradeniya Department of Agriculture herbarium and the private herbarium of one of us (B. A. Abeywickrama) abbreviated in the text as PDA and ABEY. respectively.

KEY TO THE GENERA OF THE OPHIOGLOSSACEAE

1. Sterile blade simple, venation reticulate.....OPHIOGLOSSUM
1. Sterile blade compound, venation dichotomous..... 2
2. Sterile blade pinnately divided.....BOTRYCHIUM
2. Sterile blade palmately divided.....HELMINTHOSTACHYS

BOTRYCHIUM

The genus *Botrychium* has perennial sporophytes which consist of a short unbranched rootstock with thick fleshy roots and one to several leaves. A leaf consists of a common stalk with fertile and sterile segments. The venation is dichotomous and open. The fertile segment consists of a stalk and the spike proper which may be simple or branched. Sporangia are naked and globular and very often possess short thick stalks. They are borne laterally on the branches of the spike. Each sporangium produces numerous thick walled spores and dehisces by two valves. Gametophytes are small and subterranean, cylindrical or oblong and flattened, unbranched and mycorrhizal.

In Ceylon two species of *Botrychium* are met with : *B. lanuginosum* Wall. and *B. daucifolium* Wallich. These two species can be distinguished as follows.

- Fertile segment arising from or close
to the middle of the sterile lobe.....*B. lanuginosum*
- Fertile segment arising well below
the sterile lobe.....*B. daucifolium*

***Botrychium lanuginosum* (Wall.) Hk. et Grev., var. Typicum ; (Plate 1A).**

Botrychium lanuginosum Wall., List No. 48. 1828, nomen nudum.

Botrychium lanuginosum Wall.; Hooker & Greville, Icones filicum. 1 : t. 79. 1831.

The plant is stout and fleshy and is one of the very much fern-like *Botrychia*. The blade is ternately decompound and the ultimate divisions are obtuse (Fig. 1A). The fertile lobe arises from or close to the middle of the sterile lobe. Of the 23 species of *Botrychium*, this species is unique because it is the only species where the fertile segment arises above the base as a lateral branch or pinna of the sterile blade. All the other species are characterised by the fertile segment emerging from or below the base of the sterile blade. Because of the position of the fertile blade Chrysler (1925) considers *B. lanuginosum* the most primitive of living *Botrychia*. Gametophyte structure is not known but the subgenus *Osmundopteris* in which this species is placed is characterised by the presence of a cylindrical gametophyte.

On the basis of pubescence and habit Clausen divides the population of *B. lanuginosum* (Wall.) Hk. et Grev. into two varieties. The variety *typicum* present in Ceylon is stout and fleshy, and the sterile blade and stalk are usually more or less pilose. Those of the variety *leptostachyum*, unrepresented in Ceylon, differ from the variety *typicum* in being glabrous and in being more slender.

According to Clausen this plant may be occasionally epiphytic and the typical form of this species is native in rich woods at altitudes of 4000-7000 feet in South Eastern Asia and in the islands of the East Indies. The plant is widely distributed in Northern India, Nepal, Sumatra, Java, Philippines and China. Specimens from Ceylon collected by Ferguson and Thwaites have been cited by Clausen (Herbarium of the Missouri Botanical Garden and the Gray Herbarium respectively).

Nuwara Eliya, Aug. 1862, *anonym.* C. P. 3266 (PDA) ; Nuwara Eliya, 1865, *anonym.* C. P. 3266; Nuwara Eliya, Aug. 1884, *anonym.* s. n. (PDA); Horton Plains, path to Haldum-mulla, Sept. 1890, *anonym.* s. n. (PDA); Maha Eliya patanas, Worlds End, Horton Plains, 25-1-1906, J. M. Silva s.n. (PDA); Horton Plains, World End, 3-5-1906, J. M. Silva s.n. (PDA); Hakgala peak, 24-8-26, J. M. Silva s.n. (PDA) ; Horton Plains, June 1954, B. A. Abeywickrama 249 (ABEY.).

***Botrychium daucifolium* Wallich. (Plate 1B).**

Botrychium subcarnosum Wall., List No. 49. 1828. nomen nudum.

Botrychium daucifolium Wall., Hooker et Greville, Ic. Fil., pl. 161. 1829.

Sceptridium daucifolium (Wall.) Lyon. in Bot. Gaz. 40 : 457. 1905.

It has a ternately divided leaf where the terminal divisions are much less divided than the basal ones. The ultimate divisions of the leaf are toothed (Fig. 1B). The fertile segment arises below the base of the sterile blade. The gametophyte is not known. Gametophytes are not known for most of the species of the subgenus *Sceptridium* to which *B. daucifolium* belongs. Where the gametophyte is known it is dorsiventrally flattened. The embryo possesses a suspensor and the root emerges from the lower surface of the prothallium.

According to Clausen the plant is known from the mountains of India, Southern China, Java, Borneo, Philippines and Fiji, usually at altitudes from 2500-5000 feet. A specimen collected by G. Wall from the Central Province of Ceylon has been cited by Clausen (Herbarium of the New York Botanical Garden).

Kotmale, June 1847, Gardner C. P. 1410 (PDA) ; Nitre Cave district, Sept. 1888 *anonym.* s.n. (PDA). Kalupahana, on forest floor, 28-5-56, B. A. Abeywickrama 430 (ABEY.).

HELMINTHOSTACHYS

Helminthostachys zeylanica (L.) Hooker. (Plate 1C).

Osmunda zeylanica L., Sp. pl. ed. 1. 2: 1063. 1753.

Botrychium zeylanicum (L.) Swartz, in Schrad. Journ. für die Botanik. p. III. 1800.

Helminthostachys dulcis Kaulfuss, Flora. p. 103. 1822.

Botryopteris mexicana Presl, Rel. Haenk. 1: 76. t. 12, f. 1. 1825.

Helminthostachys mexicana (Presl) Sprengel. Systema veg. ed. 16. 4: 23. 1827.

Ophiala zeylanica (L.) Desvaux, in Mém. Soc. Linn. Paris, 6: 195. 1827.

Helminthostachys zeylanica (L.) Hooker, Genera Filicum. Pl. 47b. 1842.

Helminthostachys crenata Presl, Suppl. Tent. Pterid. p. 60. 1845.

Helminthostachys integrifolia Presl, Suppl. Tent. Pterid. p. 60. 1845.

Botryopteris crenata Presl. Abh. Böhm. Ges. Wiss. 5: 324. 1847.

This is an asiatic genus which is monotypic. The species *Helminthostachys zeylanica* (L.) was described by Linnaeus (1753) as *Osmunda zeylanica* from material obtained from Ceylon. It is a perennial herb with a stout elongated unbranched rootstock. Roots are fleshy and numerous. Every season a new leaf develops and the bud from which the successive leaves develop lies in the sheathing base of its stalk. The leaf consists of a common stalk and the sterile and fertile segments. The sterile segment is sessile and is palmately compound. Venation is open and dichotomous. The lateral veins which arise from the main vein are nearly parallel and 1-3 times forked (Fig. 1C).

The fertile segment consists of a short stalk and a fruiting spike. The spike carries short lateral branches on which are borne naked ovoid sporangia in crowded glomerules. The sporangia dehisce vertically by 3 valves producing yellowish thick walled spores. The gametophyte is cylindrical and stout.

The genus is widely distributed in the Indo-Malayan and Australian regions. According to Clausen it is present in India, Indo-China, Malaya, Sumatra, Java, Borneo, Philippine Islands, China, Japan, New Guinea and Solomon Islands, New Caledonia and Australia. It is present in the low country wet zone of Ceylon where it is widespread but very localized. Clausen has cited material collected from Ceylon by G. Wall and Wight (Herbarium of the New York Botanical Garden), Thwaites (Gray Herbarium), and W. Ferguson (Herbarium of the Missouri Botanical Garden).

Vijitipura, July 1848, Gardner C. P. 1411 (PDA); Henaratgoda, 14-8-1926, J. M. Silva s. n. (PDA); Hanwella, 28-8-1927, Alston 881 (PDA); Kelaniya, 28-8-1915, J. M. Silva 1411 (PDA); Gampaha, 17-12-1938, J. E. Senaratne 2572 (PDA); Kaduwela, June 1959, M. H. V. Cooray 125 (PDA); Matara, May 1962, M. H. V. Cooray 162 (PDA); Borelasgamuwa, 3-5-1950, B. A. Abeywickrama 247 (ABEY.); Kaduwela, July 1956, B. A. Abeywickrama 335 (ABEY.).

OPHIOGLOSSUM

The genus *Ophioglossum* is the most advanced of the *Ophioglossaceae* and according to Clausen is the largest with 28 species. Using characters such as the nature and division of the blade, habit and the conditions of the fertile segment he divides the genus into 4 subgenera. Some workers however raise these subgenera to the rank of genera.

The genus *Ophioglossum* includes perennial herbs which may be terrestrial or epiphytic. The sporophyte has a short erect or prostrate unbranched rootstock with an exposed bud borne apically. Roots are short and fleshy. It carries one to several leaves and each leaf consists of a common stalk and fertile and sterile segments. The leaf blade is usually simple but sometimes may be bifurcate towards the apex. Venation is reticulate. The fertile segment consists of a stalk and a spike in which the sporangia are borne in two rows. The sporangium dehisces by a transverse suture. Spores are yellowish. Gametophytes are small, subterranean, cylindrical or ovoid, branched or unbranched, and depend on a mycorrhizal fungus for nourishment.

The genus shows extreme variation and many workers have used minor variations in venation and size as taxonomic characters. However, as Clausen points out, venation in this genus is not quite reliable for species differentiation and venation can be used only in a relative manner for classification. Spore characters and position of the sterile blade are also characters which should be used with caution. Clausen establishes 28 species. The genus is distributed in all the major geographical regions of the world.

KEY TO THE CEYLON SPECIES OF OPHIOGLOSSUM

1. Plants epiphytic, leaves strap shaped,
simple or forked.....*O. pendulum*
1. Plants terrestrial, leaves not strap
shaped..... 2
2. Rhizome globose or subglobose.....*O. pedunculatum*
2. Rhizome cylindrical..... 3
3. Blade narrowly elongate, linear.....*O. gramineum*
3. Blade ovate, deltoid or cordate..... 4
4. Blade cordate at base.....*O. reticulatum*
4. Blade ovate or truncate at base.....*O. petiolatum*

Ophioglossum pendulum L. (Plate 2A).

Ophioglossum pendulum L., Sp. pl., ed. 2. 2 : 1518. 1763.

Ophioderma pendulum (L.) Presl, Suppl. Tent. Pterid., p. 56. 1845.

Ophioglossum furcatum John Smith ; Ferns, British and Foreign, p. 272. 1866.

Ophioglossum moultoni Copeland, Journ. Straits Branch Roy. Asiatic Soc. no. 63 : 72. 1912

The plant, which is an epiphyte, has a horizontal rhizome and one to several long strap-shaped leaves. The leaves may be bifurcated towards the apex, and venation is reticulate (Fig. 1D). The fertile spike arises singly and medianly a short distance above the base of the blade. The fertile spike is slender. Spores are yellowish and gametophytes are tuberous and branched. The plant reproduces by means of vegetative buds arising from the roots.

Clausen recognizes two distinct subspecies. The subspecies *typicum* recorded for Ceylon has a lax and membranous sterile blade, 12-170 cm. long. The other subspecies *falcatum* differs from the former in having a falcate and more leathery blade. The fertile stalk is shorter, being 0.6-2.5 cm. long.

According to Clausen the subspecies *typicum* is widely distributed throughout the old world where it grows epiphytically on trees in open wood. It occurs in Madagascar, India, Malay Peninsula, Philippines, Sumatra, Java, Borneo, the Moluccas, New Hebrides, Fiji Islands, Samoa, Tahiti and in the Hawaiian Islands. This is widely distributed in the wet zone areas of Ceylon. Ceylon material collected by Ferguson (Gray Herbarium and the Herbarium of the Missouri Botanical Garden), Oldfield (New York Botanical Garden) and Walker (Gray Herbarium) have been cited by Clausen.

Pasdunkorale, 1848, *Gardner C. P.* 1409 (PDA) ; Labugama, Jan. 1885, *anonym, s.n.*, (PDA) ; Hewessa, March 1887, *anonym, s.n.* (PDA) ; Between Eratne and Kuruwita, 21-2-27, *J. M. Silva s.n.* (PDA) ; Ritigala, May 1952, *B. A. Abeywickrama* 322 (ABEY.) ; Kitulgala, June 1953, *B. A. Abeywickrama* 294 (ABEY.) ; Ritigala, May 1954, *B. A. Abeywickrama* 294 (ABEY.).

Ophioglossum pedunculatum Desvaux. (Plate 2B).

Ophioglossum pedunculatum Desvaux, in Magazin Gesellschaft Naturforsch Freunde Berlin 5 : 306. 1811.

Ophioglossum capense & regulare Schlechtendal, Adumbratio filicum in promontorio Bonae Spei provenientum, p. 9. pl. 1, fig. 2. 1825.

Ophioglossum fibrosum Schumacher, in K. Danske Videnskabernes Naturvidenskabelige og Mathematisk Afhandling 4 : 226. 1827.

- Ophioglossum Wightii* Greville & Hooker, in Bot. Misc. 3 : 218. 1833.
- Ophioglossum brevipes* Beddome, Ferns of Southern India, p. 23. pl. 72. 1863.
- Ophioglossum cuspidatum* Milde, in Bot. Zeit., p. 107. 1864.
- Ophioglossum bulbosum* Beddome, Ferns of British India, Suppl., p. 28. 1876.
- Ophioglossum regulare* (Schlechtendal) C. Christensen, Index Filicum, p. 471. 1906.

The plant has a tuberous rootstock bearing numerous fleshy roots and several leaves during a single season. According to Clausen the plant is 11-18 cm. high, but the local material was found to be much smaller. The leaf blade is elliptical or ovate, apiculate, cuneate to subtruncate at base. The primary veins form large areoles in which are included veinlets which form secondary areoles (Fig. 1E). The fertile spike is 0.8-2.5 cm. with a stalk of 4-5.5 cm. in length. The gametophyte is not known. *O. pedunculatum* (which name replaces the former *O. fibrosum* Schum.) is widely distributed in the old world tropics. It was first recorded from Ceylon by Prantl (1884).

Puttalam, 1881, *anonym. s.n.* (PDA) : Uma-oya, Oct. 1884, *anonym. s.n.* (PDA) ; Haragama, 29-5-1932, *Simpson* 9730 (PDA) ; On Patanas about Bambragala, *anonym. C. P.* 3993 (PDA) ; Monaragala district, RNP Block 3, a few miles east of Vaddangewadiya, north of Kataragama, N. *Wiravan* 648 (PDA).

***Ophioglossum gramineum* Willd. (Plate 2C).**

- Ophioglossum gramineum* Willd., Schrift. Ak. Erfurt. 18. t. 1, f. 1. 1802.
- Ophioglossum costatum* R. Brown, Prod. Fl. Nov. Holl., p. 163. 1810.
- Ophioglossum gracillimum* Welwetsch, in Hooker & Baker, Synopsis Filicum, p. 445. 1868.
- Ophioglossum lusitanicum* var. *gracillimum* A. Braun ; in Kuhn. Fil. Afr., p. 177. 1868.
- Ophioglossum vulgatum* var. *lanceolatum* Luerssen, in Journ. Mus. Godeffr. 8 : 247C. pl. 12. 1875.
- Ophioglossum luso-africanum* Welw., Prantl, in Ber. deutsch. bot. Ges. 1 : 351. 1883.
- Ophioglossum dietrichiae* Prantl, in Ber. deutsch. bot. Ges. 1 : 352. 1883.
- Ophioglossum lanceolatum* (Luerss.) Prantl. in Ber. deutsch. bot. Ges. 1 : 352. 1883.
- Ophioglossum moluccanum* f. *inconspicuum* Raciborski, in Nat. Tijdschr. Ned. Ind. 59 : 237. pl. 2, f. 5. 1900.

Ophioglossum prantlii C. Christensen, Index Filicum, p. 471. 1906.

Ophioglossum inconspicuum (Rac.) van Alderwerelt van Rosenburgh, in Bull. Dept. Agric. Ind. Neerl. 21 : 9. 1908.

Ophioglossum gregarium Christ, in Nova Guinea, Botanique 1. 8 : 164. 1909. Based on *O. inconspicuum* var. *majus*.

According to Clausen the plants are 5-15 cm. high, but local material less than 5 cm. in height were observed. The size of the Ceylon material is very variable and it merges into *O. pedunculatum*. The rhizome is cylindrical bearing usually one leaf but rarely more than one leaf may be present. The leaf blade is linear lanceolate. The principal veins form large areoles not enclosing secondary areoles. Occasionally free veinlets may be present (Fig. 1F).

Clausen considers about 10 earlier described species as synonyms for *O. gramineum* as he fails to observe any noteworthy characters which justify such a segregation. The plant occurs in Africa, India, the East Indies and Australia.

According to Alston* this plant is used for the treatment of toothache and fever.

Dambulla Rock, 20-12-1881, *anonym. s.n.* (PDA) ; Uma-oya, Oct. 1884, *anonym. s.n.* (PDA) ; Kurunegala Rock, 22-6-27, Alston 708 (PDA).

***Ophioglossum reticulatum* L. (Plate 2D).**

Ophioglossum reticulatum L., Sp. pl. 2 : 1063. 1763.

Ophioglossum peruvianum Presl, Suppl. Tent. Pterid., p. 52. 1845.

This species has a short erect rootstock carrying one or rarely several leaves during a season. The sterile blade is usually cordate, broadly ovate and either cordate or broad-truncate at base. The apex is obtuse, rounded or acute. The venation is lax and diffuse, the veins forming areoles 0.5-1.5 mm. long and 0.5-3 mm. wide (Fig. 1G). The fertile stalk is 5-18 cm. long and the fruiting spike is 1-5.5 cm. long. The gametophyte is not known.

According to Clausen *O. reticulatum* grows in a variety of habitats with a wide range of tolerance. The species is pan-tropical being found in tropical regions of both the old and the new world at altitudes of 60-4000 feet. A specimen collected from Ceylon by Ferguson has been cited by Clausen (Herbarium of the Missouri Botanical Garden).

anonym. C. P. 1408 *s.n. p.p.* (PDA ; Nugegoda, June 1959, M. H. V. Cooray 130 (PDA).

*Alston, 22-6-27, No. 708 (PDA).

***Ophioglossum petiolatum* Hooker (Plate 2E).**

Ophioglossum petiolatum Hooker, Exotic Flora 1: 56. 1823.

Ophioglossum moluccanum Schlecht., Adumbratio Filicum in promontorio Bonae Spei provenientium, p. 9. 1825.

Ophioglossum cordifolium Roxb., Wall., List, no. 47. 1828.

Ophioglossum elongatum A. Cunningham in Hooker's Companion to the Botanical Magazine. 2: 361. 1836.

Ophioglossum cognatum Presl, Suppl. Tent. Pterid., p. 53. 1845.

Ophioglossum cumingianum Presl, Suppl. Tent. Pterid., p. 52. 1845.

Ophioglossum obovatum and *O. timorense* Miquel, in Ann. Mus. Bot. Lugd. Bat. 4: 93. 1868-69.

Ophioglossum vulgatum L. var. *australasiaticum* Luerssen in part, in Journ. des Museum Godeffroy. 3: 246c. 1875.

Ophioglossum pedunculatum sensu Prantl (non Desvaux, 1811), in Jahrb. Bot. Gart. Berlin. 3: 328. 1884.

Ophioglossum raciborskii van Alderwerelt van Rosenburgh, in Bull. Jard. Bot. Buit. Series 2, no. 28: 35. 1918.

Ophioglossum pedunculatum Nakai, in Bot. Mag. Tokyo. 39: 193. 1925.

Ophioglossum littorale Makino, in Journ. Jap. Bot. 6: 27. 1929.

Ophioglossum floridanum E. P. St. John, in Amer. Fern. Journ. 26: 52-55, figs. 1-3. 1936.

This has a slender erect rhizome bearing several long slender roots and one or more usually several leaves during a growing season. Vegetative reproduction is common. The sterile blade is lance-ovate and acute at apex, obtuse or subtruncate at base. As in *O. reticulatum* the venation is lax and the veins form areoles. According to Clausen the fertile stalk is 1.5-9 cm. long but some of the Peradeniya material has fertile stalks as much as 12 cm. long. The fruiting spike is 1-4 cm. long. Clausen states that this species has a wide distribution in the New World but is less common than in the Old World. Gametophyte structure is not known.

Ramboda, July 1847, Gardner C. P. 1408, s.n. (PDA) : Hakgala, Nov. 1884, *anonym.* s.n. (PDA) ; *anonym.* C. P. 1408 s.n. p.p. (PDA).

O. reticulatum and *O. petiolatum* are very much similar and may even represent a single variable species. Both types have erect rootstocks. The leaf of *O. reticulatum* is cordate at base while in *O. petiolatum* the leaf is ovate or truncate at base. In *O. reticulatum* there is

usually one leaf during a growing season but rarely more than one leaf may be present. In *O. petiolatum* the presence of more than one leaf is the usual condition. In both types the veins form areoles but on the whole the venation is lax and diffuse. Typically *O. petiolatum* is smaller than *O. reticulatum*. Gametophytes of both species are not known. The two species are very closely related and according to Clausen in certain parts of the world, notably in India, China and Mexico the two populations seem to integrate. The Ceylon material of *O. reticulatum* is so close to *O. petiolatum* that it is very likely that the two forms represent only a single species. However we here follow Clausen and maintain them as two distinct species until more investigations are made to determine the actual relationship of the two.

Ophioglossum sarcophyllum Desvaux has been recorded from the Nuwara Eliya plains by G. Wall (Herbarium of the New York Botanical Garden). Clausen doubts whether this specimen is one of *O. sarcophyllum*. Probably that observed as *O. sarcophyllum* must have been a variable form of *O. petiolatum*.

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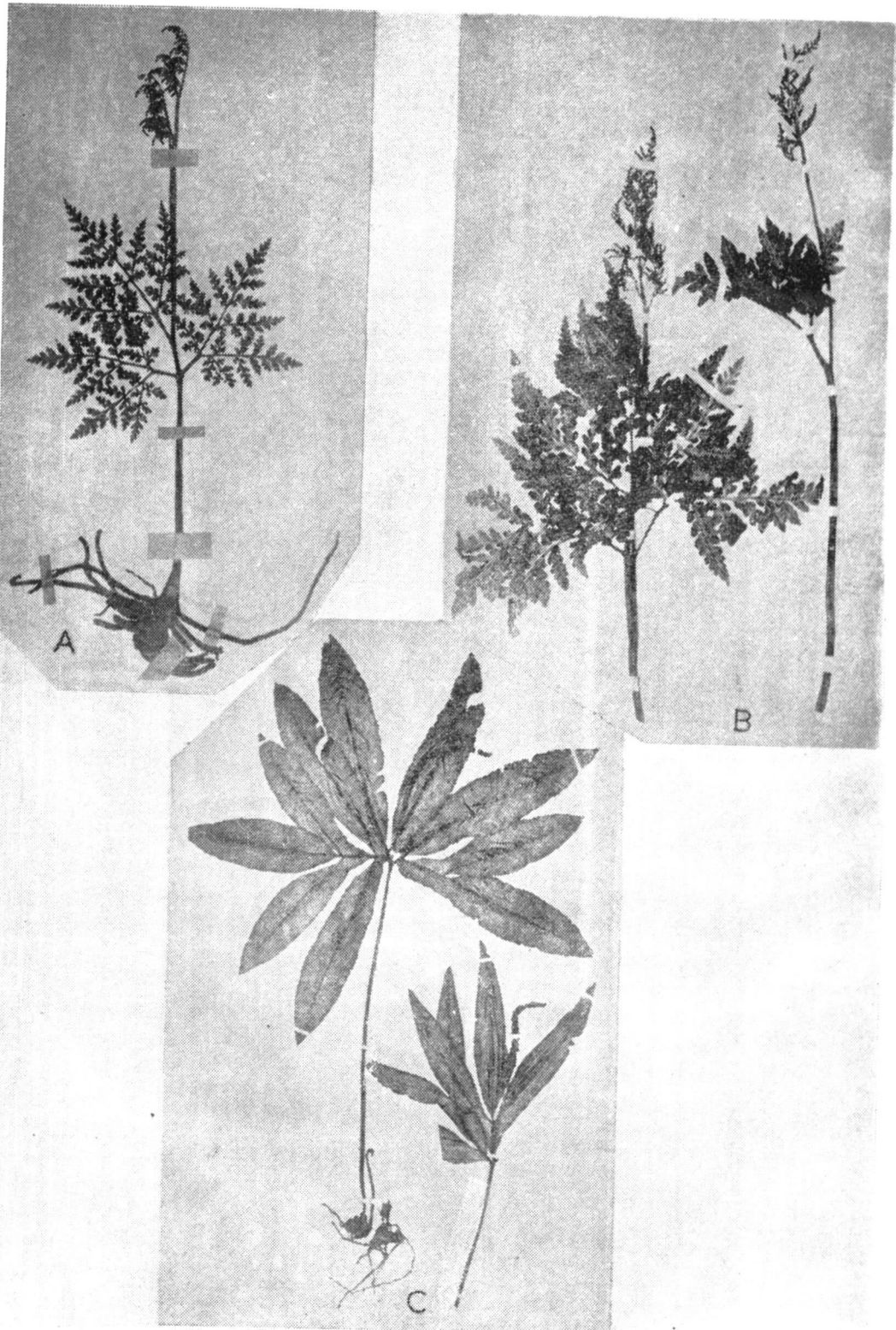
LEGENDS FOR FIGURE 1 AND PLATES 1 AND 2

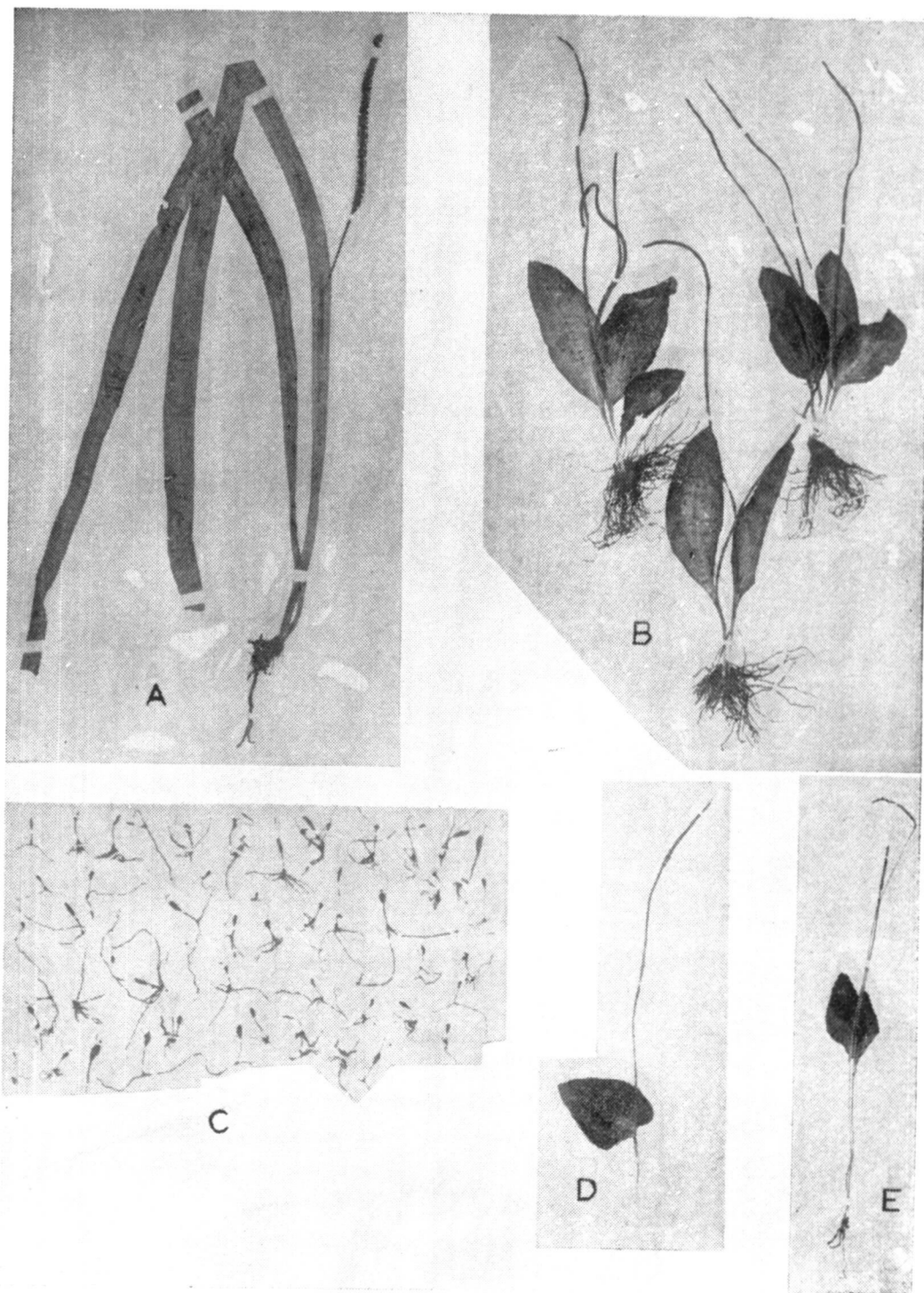
Fig. 1. Entire or portions of lamina showing venation. A, *Botrychium lanuginosum*. X $\frac{1}{2}$. B, *Botrychium daucifolium*. X1 $\frac{1}{2}$. C, *Helminthostachys zeylanica*. X2. D, *Ophioglossum pendulum*. X $\frac{1}{2}$. E, *O. pedunculatum*. X1. F, *O. gramineum*. X3. G, *O. reticulatum*. X1.

Plate 1. A, *Botrychium lanuginosum*. X $\frac{1}{2}$. B, *Botrychium daucifolium*. X $\frac{1}{2}$. C, *Helminthostachys zeylanica*. X $\frac{1}{2}$.

Plate 2. A, *Ophioglossum pendulum*. X $\frac{1}{2}$. B, *O. pedunculatum*. X $\frac{1}{2}$. C, *O. gramineum*. X $\frac{1}{2}$. D, *O. reticulatum*. X $\frac{1}{2}$. E, *O. petiolatum*. X $\frac{1}{2}$.

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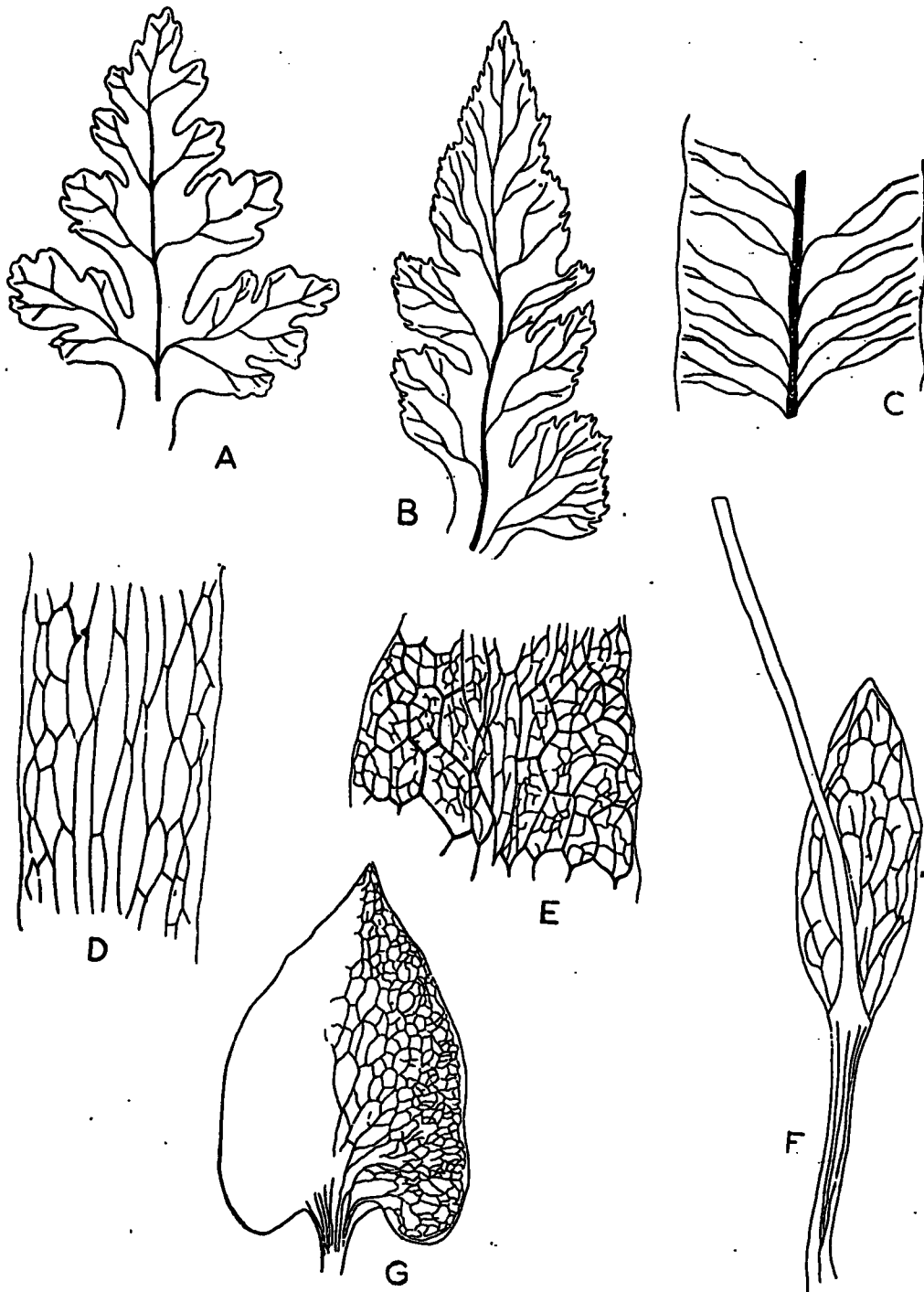


Fig. 1